

### *Abstract*

The present invention provides transition-metal-catalyst-based methods for the arylation and vinylation of activated methyl, methylene, and methine carbons with aryl halides, vinyl halides, and the like. The methods of the invention provide several 5 improvements over existing methods, including the ability to synthesize efficiently and under mild conditions  $\alpha$ -aryl and  $\alpha$ -vinyl products from a wide range of starting materials, including ketones, esters, hydrazones, and imines. Furthermore, the methods of the invention may be used in an asymmetric sense, i.e. to produce enantiomerically-enriched chiral  $\alpha$ -aryl and  $\alpha$ -vinyl products.

10

卷之三